

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



United States
Department of
Agriculture

Forest Service

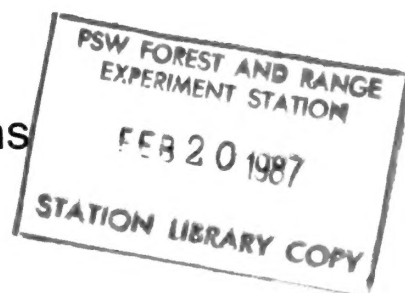
Pacific Northwest
Research Station

Research Note
PNW-RN-451
November 1986



Botanical Reconnaissance of Meeks Table Research Natural Area, Washington

Reid Schuller and Shelley Evans



Abstract

A floristic survey of Meeks Table Research Natural Area in the Wenatchee National Forest, Washington, documents 159 vascular plant taxa representing 39 families. This paper provides estimates of abundance by plant community or by other habitat characteristics for all taxa listed. Plant communities are described and mapped based on current vegetation.

Keywords: Communities (plant), vascular plants, checklist (vascular plants), Res. Nat. Area—Meeks Table, Meeks Table Res. Nat. Area.

Environment

Meeks Table Research Natural Area (RNA) occupies a 27-ha tract along the eastern slopes of the Cascade Range in southern Washington. The RNA is in Yakima County within portions of sections 5 and 6, T. 15 N., R. 14 E., Willamette Meridian. It is administered by the Naches Ranger District, Wenatchee National Forest.

Meeks Table is an isolated, flat-topped butte that slopes gently eastward from its 1380-m summit to 1280 m, the lowest point within the RNA. The butte is a remnant of a basalt plateau that rose 150 m above the adjacent rolling terrain. Meeks Table is surrounded by 60- to 90-m, near-vertical cliffs that drop into long talus slopes (Franklin and others 1972).

The climate is modified continental. Winter temperatures are cool to cold. A major portion of the average annual precipitation falls as snow from October to March; in some places, snowfall persists into May. Spring rains typically give way to a warm-to-hot, dry period from July through August. Less than 10 percent of the average annual precipitation occurs during this period (Donaldson 1979, Franklin and Dyrness 1973).

Soils are partially described by Rummell (1951) and are further characterized by Tiedemann and Klock (1977). The soils beneath the forest overstory are weakly podzolized and have developed over buried soils in approximately 20 cm of volcanic ash. Nonforested areas support either a nonpodzolized shallow soil with biscuit-and-swale topography or wind-scoured barrens with negligible soil development.

REID SCHULLER is natural areas scientist, Washington Natural Heritage Program, Department of Natural Resources, Mail stop: EX-13, Olympia, Washington 98504. SHELLEY EVANS is biological technician, U.S. Fish and Wildlife Service, 2625 Parkmont Lane, Olympia, Washington 98502. This research was supported by a contract between the Pacific Northwest Research Station and Oregon State University and the Pacific Northwest Research Natural Area Committee.

Community Types

Vegetation of Meeks Table has been described (Rummell 1951, Tiedemann and others 1972) and has been sampled and mapped (Tiedemann and Klock 1977). Boundaries for community types were adapted from Tiedemann and Klock (1977); however, names for community types have been changed from those appearing in Tiedemann and Klock (1977) for two reasons: First, three of their community types included *Artemisia rigida* (Nutt.) Gray in the community nomenclature. This species is not present on Meeks Table. *Artemisia arbuscula* Nutt. var. *arbuscula* is the major shrub species in areas that were previously mapped as *Artemisia rigida* community types (Tiedemann and Klock 1977). Second, community nomenclature has also been revised to reflect the current naming conventions used by the Pacific Northwest Region of the USDA Forest Service (Williams and Lillybridge 1983). A virgule (/) separates members of different life forms (trees, shrubs, herbs), and a hyphen (–) separates members of the same life form. Community types are described by the dominant overstory species in combination with a dominant understory species regardless of life form. Therefore, only two life forms are represented in the designation of community type rather than three, as used by Tiedemann and Klock (1977). Five communities are distinguishable at Meeks Table (fig. 1).

The *Artemisia arbuscula*-*Eriogonum douglasii*/*Poa secunda* community occupies 3 ha along the rocky southern exposure of Meeks Table (fig. 2). It is equivalent to the *Artemisia rigida*/*Poa sandbergii*/*Eriogonum douglasii* community described by Tiedemann and Klock (1977). *Artemisia arbuscula*, *Eriogonum douglasii*, and *Purshia tridentata* alternate codominance within the shrub layer. *Poa secunda* has the highest cover and frequency within the herbaceous layer.

The *Artemisia arbuscula*/*Sedum stenopetalum* community occupies 11 ha of the central and northern portions of Meeks Table (fig. 3). This community has been described by Tiedemann and Klock (1977) as *Artemisia rigida*/*Stipa occidentalis*/*Phlox diffusa*. *Artemisia arbuscula* is the most common shrub, although it accounts for less than 5 percent of the canopy cover. *Sedum stenopetalum* is the most abundant herb; it averages 5 percent cover and 100 percent frequency throughout the community (Tiedemann and Klock 1977). Grasses such as *Stipa occidentalis* var. *minor* and *Danthonia unispicata* are present throughout, but at low cover values.

The *Artemisia arbuscula*/*Stipa occidentalis* var. *minor* community occupies a 1-ha area along the northern rim of Meeks Table (fig. 4). Tiedemann and Klock (1977) refer to this area as the *Artemisia rigida*/*Stipa occidentalis*/*Phlox diffusa* community. *Artemisia arbuscula* dominates the shrub layer and *Stipa occidentalis* var. *minor* is an abundant and conspicuous component of the herb layer. Other grasses such as *Danthonia intermedia* and *Poa secunda* are common locally within this community.

The *Pinus ponderosa*/*Calamagrostis rubescens* community occupies 7 ha of the central and southern portions of Meeks Table (fig. 5). This community is described by Tiedemann and Klock (1977) as *Pinus ponderosa*/*Calamagrostis rubescens*/*Lupinus laxiflorus*. *Pinus ponderosa* is the major overstory tree, but size-class distribution suggests that *Pseudotsuga menziesii* will gradually attain a dominant position in most of this community in the absence of fire or other natural disturbance. *Calamagrostis rubescens* is abundant throughout the herbaceous layer and often accounts for 50 percent of cover. *Lupinus laxiflorus* var. *laxiflorus* is also abundant and accounts for 10 percent of cover in the herb layer.

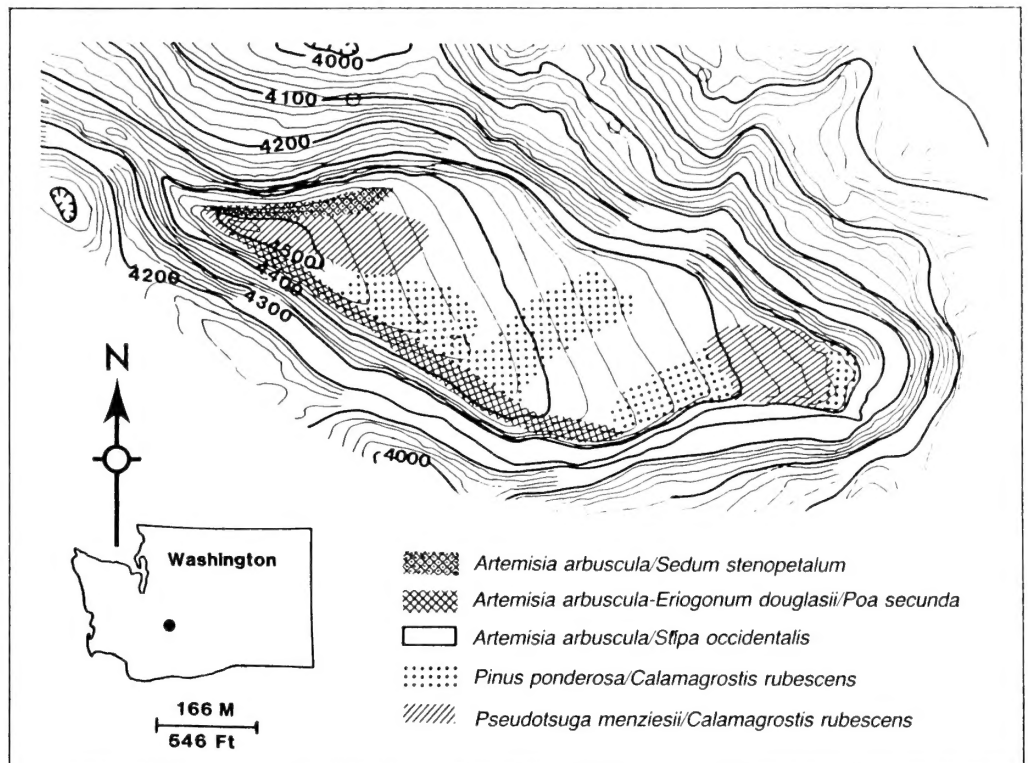


Figure 1—Plant communities at Meeks Table Research Natural Area, Washington.

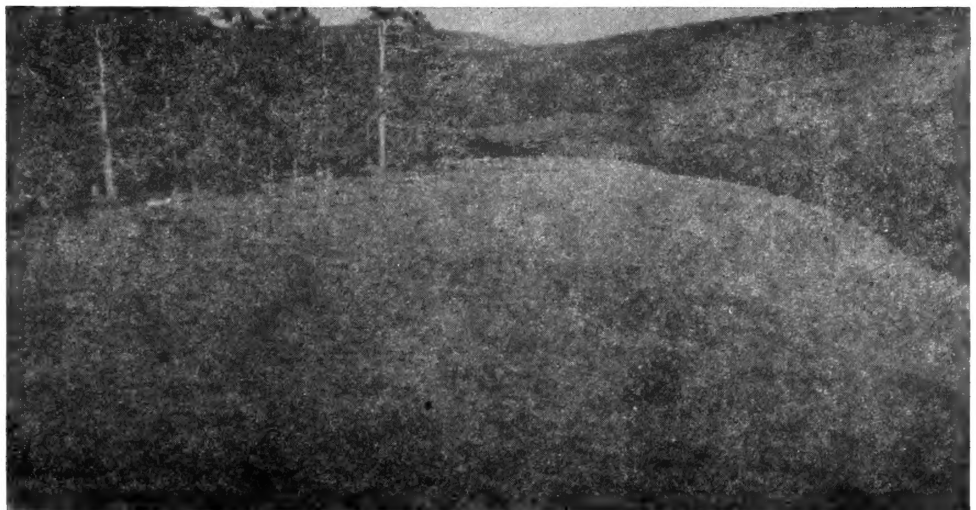


Figure 2—*Artemisia arbuscula-Eriogonum douglasii/Poa secunda* community at Meeks Table Research Natural Area, Washington.



Figure 3—*Artemisia arbuscula*/*Sedum stenopetalum* community at Meeks Table Research Natural Area, Washington.



Figure 4—*Artemisia arbuscula*/*Stipa occidentalis* var. *minor* community at Meeks Table Research Natural Area, Washington.



Figure 5—*Pinus ponderosa*/*Calamagrostis rubescens* community at Meeks Table Research Natural Area, Washington.

The *Pseudotsuga menziesii*/*Calamagrostis rubescens* community occupies 6 ha along the eastern and western ends of Meeks Table. Tiedemann and Klock (1977) describe these areas as *Abies grandis*/*Calamagrostis rubescens*/*Arnica cordifolia*. These areas are currently dominated by *Pinus ponderosa* with *Pseudotsuga menziesii* as a minor associate in the tree canopy. *Abies grandis* and *Pseudotsuga menziesii* account for a disproportionately large amount of the density in smaller size classes. This suggests eventual replacement of or codominance with *Pinus ponderosa* in the absence of fire or other natural disturbance. This community also contains the greatest diversity of tree species at Meeks Table; it supports moderate amounts of *Larix occidentalis* and an occasional *Pinus contorta* and *Picea engelmannii*. Understory species are dominated by *Calamagrostis rubescens*, *Carex geyeri*, and *Arnica cordifolia*. Shrubs play a very minor role in the physiognomy and composition of this community.

Methods

A botanical reconnaissance was conducted on single-day visits during June, July, and September 1983 and during April, May, June, August, and October 1984. All communities on Meeks Table were inspected on at least two separate occasions. Specimens were identified primarily in the field. Difficult determinations were made from voucher specimens and were compared with specimens at the C. Leo Hitchcock Herbarium, University of Washington, Seattle. Voucher specimens of *Artemisia arbuscula* were determined by and are deposited in the Marion Ownbey Herbarium, Washington State University, Pullman.

Botanical nomenclature follows Hitchcock and Cronquist (1973) except for the use of *Poa secunda* Presl in preference to *Poa sandbergii* Vasey (Arnow 1981). Hitchcock and others (1955, 1959, 1961, 1964, 1969) were used as references throughout the project.

Within each plant community, abundance was estimated visually by using ordinal ranking: rare, infrequent, occasional, common, and abundant. Families are arranged alphabetically, as are genera and species.

A total of 159 vascular plant taxa representing 39 families are listed in the appendix. Table 1 indicates the number of taxa within each family represented in the RNA. Table 2 indicates the presence or absence of each taxon in the five plant communities described earlier and illustrated in figure 1.

**Table 1—Vascular plant families
and number of taxa in Meeks
Table Research Natural Area**

Family	Number of taxa
Aceraceae	1
Apiaceae	10
Asteraceae	29
Berberidaceae	1
Boraginaceae	1
Brassicaceae	2
Caprifoliaceae	1
Caryophyllaceae	6
Celastraceae	1
Crassulaceae	3
Cupressaceae	1
Cyperaceae	2
Ericaceae	5
Fabaceae	2
Gentianaceae	1
Grossulariaceae	2
Hydrangeaceae	1
Hydrophyllaceae	4
Iridaceae	1
Liliaceae	7
Loranthaceae	1
Onagraceae	2
Orchidaceae	4
Orobanchaceae	1
Pinaceae	6
Poaceae	19
Polemoniaceae	4
Polygonaceae	6
Polypodiaceae	1
Portulacaceae	2
Primulaceae	1
Ranunculaceae	3
Rhamnaceae	1
Rosaceae	10
Rubiaceae	1
Salicaceae	1
Saxifragaceae	3
Scrophulariaceae	10
Violaceae	2

Table 2—Presence or absence of vascular plant taxa within 5 plant communities in Meeks Table Research Natural Area

Species	Plant communities					Other 1/
	<u>Artemisia arbuscula-</u> <u>Eriogonum douglasii/</u> <u>Poa secunda</u>	<u>Artemisia arbuscula/</u> <u>Sedum stenopetalum</u>	<u>Artemisia arbuscula/</u> <u>Stipa occidentalis</u> <u>var. minor</u>	<u>Pinus ponderosa/</u> <u>Calamagrostis</u> <u>rubescens</u>	<u>Pseudotsuga menziesii/</u> <u>Calamagrostis</u> <u>rubescens</u>	
<u>Abies grandis</u>					X	X
<u>Acer glabrum</u>						
<u>Achillea millefolium</u>	X	X	X	X	X	X
<u>Agoseris aurantiaca</u>		X	X			
<u>Agoseris glauca</u>	X		X			
<u>Agoseris heterophylla</u>						X
<u>Agropyron spicatum</u>						
<u>Agrostis exarata</u>	X		X			
<u>Allium acuminatum</u>	X	X			X	
<u>Amelanchier alnifolia</u>						
<u>Anaphalis margaritacea</u>			X	X		
<u>Antennaria dimorpha</u>	X	X	X			
<u>Antennaria flagellaris</u>	X	X	X			
<u>Antennaria luzuloides</u>		X	X			
<u>Antennaria microphylla</u>	X	X	X	X	X	
<u>Antennaria racemosa</u>		X	X			
<u>Arabis divaricarpa</u>	X	X	X			
<u>Arabis sparsiflora</u>	X	X	X			
<u>Arceuthobium douglasii</u>					X	
<u>Arctostaphylos nevadensis</u>	X		X			X
<u>Arctostaphylos uva-ursi</u>	X		X			
<u>Arenaria congesta var. congesta</u>	X	X	X			
<u>Arenaria congesta var. prolifera</u>	X	X	X			
<u>Arenaria macrophylla</u>	X	X	X	X	X	
<u>Arnica cordifolia</u>			X	X	X	
<u>Arnica fulgens</u>		X	X			
<u>Artemisia arbuscula</u>	X	X	X			
<u>Balsamorhiza careyana</u>	X	X				X
<u>Balsamorhiza sagittata</u>						X
<u>Berberis repens</u>						
<u>Bromus carinatus</u>			X	X	X	
<u>Bromus tectorum</u>	X					
<u>Calamagrostis rubescens</u>			X	X	X	X
<u>Calochortus macrocarpus</u>				X	X	
<u>Calypso bulbosa</u>		X	X	X	X	
<u>Carex geyeri</u>	X	X	X			
<u>Castilleja miniata</u>			X			
<u>Castilleja thompsonii</u>	X	X	X			
<u>Ceanothus velutinus</u>				X		
<u>Chimaphila umbellata</u>					X	
<u>Claytonia lanceolata</u>		X				
<u>Collinsia parviflora</u>	X	X	X	X	X	
<u>Collomia grandiflora</u>						X
<u>Coralorrhiza maculata</u>				X		
<u>Cordylanthus capitatus</u>	X		X			
<u>Crepis intermedia</u>			X			
<u>Cryptantha torreyana</u>	X	X	X	X		
<u>Cystopteris fragilis</u>		X				X
<u>Danthonia intermedia</u>		X		X	X	
<u>Danthonia unispicata</u>	X	X	X			
<u>Delphinium nuttallianum</u>		X				X
<u>Dodecatheon cf. conjugens</u>						

See footnote at end of table.

Table 2—Presence or absence of vascular plant taxa within 5 plant communities in Meeks Table Research Natural Area (continued)

Species	Plant communities					Other 1/
	<u>Artemisia arbuscula-</u> <u>Eriogonum douglasii/</u> <u>Poa secunda</u>	<u>Artemisia arbuscula/</u> <u>Sedum stenopetalum</u>	<u>Artemisia arbuscula/</u> <u>Stipa occidentalis</u> <u>var. minor</u>	<u>Pinus ponderosa/</u> <u>Calamagrostis</u> <u>rubescens</u>	<u>Pseudotsuga menziesii/</u> <u>Calamagrostis</u> <u>rubescens</u>	
<u>Epilobium angustifolium</u>				X	X	
<u>Epilobium cf minutum</u>	X		X			
<u>Erigeron bloomeri</u>	X	X				
<u>Erigeron linearis</u>	X	X	X			
<u>Eriogonum compositum</u>	X	X	X			
<u>Eriogonum douglasii</u>	X	X	X			
<u>Eriogonum elatum</u>			X			
<u>Eriogonum umbellatum</u>						X
<u>Erythronium grandiflorum</u>		X		X	X	
<u>Festuca idahoensis</u>	X	X	X			
<u>Festuca occidentalis</u>				X		
<u>Festuca octoflora</u>	X		X			
<u>Festuca ovina</u>				X	X	
<u>Frasera speciosa</u>				X	X	
<u>Fritillaria pudica</u>			X	X		
<u>Galium multiflorum</u>	X					X
<u>Geum triflorum</u>		X	X	X		
<u>Goodyera oblongifolia</u>				X		
<u>Habenaria unalascensis</u>					X	
<u>Haplopappus carthamoides</u>		X	X			
<u>Haplopappus lanuginosus</u>		X	X			
<u>Haplopappus resinosus</u>						X
<u>Haplopappus stenophyllus</u>	X	X				
<u>Hesperochiron pumilus</u>				X		
<u>Heuchera cylindrica</u>		X	X			
<u>Hieracium albiflorum</u>			X	X	X	X
<u>Hieracium cynoglossoides</u>			X	X		
<u>Holodiscus discolor</u>				X	X	
<u>Holosteum umbellatum</u>						X
<u>Hydrophyllum capitatum</u>	X					
<u>Juniperus communis</u>						X
<u>Koeleria cristata</u>	X	X	X	X	X	
<u>Larix occidentalis</u>		X		X	X	
<u>Lewisia rediviva</u>	X					
<u>Lilium columbianum</u>				X	X	
<u>Linanthus harknessii</u>			X			
<u>Lithophragma bulbifera</u>	X	X	X			
<u>Lomatium canbyi</u>	X					
<u>Lomatium dissectum</u>	X	X	X			
<u>Lomatium gormanii</u>	X	X	X			
<u>Lomatium gravi</u>	X					
<u>Lomatium macrocarpum</u>	X	X	X			
<u>Lomatium nudicaule</u>	X	X	X	X		
<u>Lomatium triternatum</u>	X	X	X	X	X	
<u>Lomatium watsonii</u>	X					
<u>Luina nardosmia</u>					X	
<u>Lupinus laxiflorus</u>	X	X	X	X	X	
<u>Lupinus polyphyllus</u>					X	
<u>Madia glomerata</u>			X			
<u>Melica bulbosa</u>	X					
<u>Microseris nutans</u>						X
<u>Microseris troximoides</u>	X	X	X			
<u>Microsteris gracilis</u>	X					
<u>Mitella pentandra</u>					X	

See footnote at end of table.

Table 2—Presence or absence of vascular plant taxa within 5 plant communities in Meeks Table Research Natural Area (continued)

Species	Plant communities					Other 1/
	<u>Artemisia arbuscula-</u> <u>Eriogonum douglasii/</u> <u>Poa secunda</u>	<u>Artemisia arbuscula/</u> <u>Sedum stenopetalum</u>	<u>Artemisia arbuscula/</u> <u>Stipa occidentalis</u> <u>var. minor</u>	<u>Pinus ponderosa/</u> <u>Calamagrostis</u> <u>rubescens</u>	<u>Pseudotsuga menziesii/</u> <u>Calamagrostis</u> <u>rubescens</u>	
<u>Orobanche corymbosa</u>	X					
<u>Osmorhiza chilensis</u>					X	
<u>Pachistima myrsinites</u>				X	X	
<u>Pedicularis racemosa</u> var. <u>alba</u>		X				
<u>Pedicularis racemosa</u> var. <u>racemosa</u>				X	X	
<u>Penstemon attenuatus</u>					X	
<u>Penstemon fruticosus</u>					X	
<u>Penstemon gairdneri</u>	X		X			
<u>Penstemon richardsonii</u>						X
<u>Perideridia gairdneri</u>				X	X	
<u>Phacelia linearis</u>	X					
<u>Phacelia sericea</u>			X			
<u>Philadelphus lewisii</u>						X
<u>Phlox diffusa</u>	X	X	X			
<u>Picea engelmannii</u>					X	
<u>Pinus contorta</u>					X	
<u>Pinus ponderosa</u>				X	X	
<u>Poa nervosa</u>			X		X	
<u>Poa secunda</u>	X	X	X	X	X	
<u>Polygonum aviculare</u>						X
<u>Polygonum kelloggii</u>	X	X	X			
<u>Potentilla arguta</u>	X			X		
<u>Potentilla fruticosa</u>			X			X
<u>Potentilla gracilis</u>		X				X
<u>Prunus virginiana</u>				X	X	
<u>Pseudotsuga menziesii</u>				X	X	
<u>Pterospora andromedea</u>				X	X	
<u>Purshia tridentata</u>	X		X			X
<u>Ranunculus glaberrimus</u> var. <u>ellipticus</u>						X
<u>Ranunculus glaberrimus</u> var. <u>glaberrimus</u>						X
<u>Ribes cereum</u>	X					
<u>Ribes viscosissimum</u>						X
<u>Rosa gymnocarpa</u>					X	
<u>Salix scouleriana</u>					X	
<u>Sedum lanceolatum</u>	X					
<u>Sedum leiberqii</u>	X	X	X			
<u>Sedum stenopetalum</u>	X	X	X	X		
<u>Senecio integerrimus</u>		X				
<u>Setaria viridis</u>					X	
<u>Silene douglasii</u>				X		X
<u>Silene oregana</u>			X	X	X	
<u>Sisyrinchium douglasii</u>	X	X	X	X		
<u>Sitanion hystrix</u>	X	X	X			
<u>Spiraea betulifolia</u>					X	
<u>Stipa lemmonii</u>	X	X				
<u>Stipa occidentalis</u>	X	X	X			
<u>Symphoricarpos oreophilus</u>				X	X	
<u>Vaccinium myrtillus</u>					X	
<u>Viola nuttallii</u>						X
<u>Viola trinervata</u>	X	X	X			
<u>Zigadenus paniculatus</u>	X	X	X			
<u>Zigadenus venenosus</u>	X	X	X	X		

1/ Presence under "other" is discussed in the entry for the taxon in the appendix.

Acknowledgment

We gratefully acknowledge the timely and informed assistance provided us by Joy Mastroguiseppe, Curator of the Marion Ownbey Herbarium, Washington State University, Pullman.

English Equivalents

1 centimeter (cm) = 0.4 inch
 1 meter (m) = 3.3 feet
 1 kilometer (km) = 0.6 mile
 1 hectare (ha) = 2.5 acres

Literature Cited

- Arnow, L.A.** *Poa secunda* Presl versus *P. sandbergii* Vasey (Poaceae). Systematic Botany. 6(4): 412-421; **1981**.
- Donaldson, W.R.** Washington climate for the following counties: Grant, Kittitas, Klickitat, Yakima. EM 4422. Pullman, WA: Washington State University, College of Agriculture, Cooperative Extension Service; **1979**. Unnumbered pages.
- Franklin, Jerry F.; Dyrness, C.T.** Natural vegetation of Oregon and Washington. Gen. Tech. Rep. PNW-8. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; **1973**. 417 p.
- Franklin, Jerry F.; Hall, Frederick C.; Dyrness, C.T.; Maser, Chris.** Federal Research Natural Areas in Oregon and Washington: a guidebook for scientists and educators. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; **1972**: ME-1-ME-7.
- Hitchcock, C.L.; Cronquist, A.** Flora of the Pacific Northwest. Seattle: University of Washington Press; **1973**. 730 p.
- Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.** Vascular plants of the Pacific Northwest. Part 5: Compositae. Seattle: University of Washington Press; **1955**. 343 p.
- Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.** Vascular plants of the Pacific Northwest. Part 4: Ericaceae through Campanulaceae. Seattle: University of Washington Press; **1959**. 510 p.
- Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.** Vascular plants of the Pacific Northwest. Part 3: Saxifragaceae to Ericaceae. Seattle: University of Washington Press; **1961**. 614 p.
- Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.** Vascular plants of the Pacific Northwest. Part 2: Salicaceae to Saxifragaceae. Seattle: University of Washington Press; **1964**. 597 p.
- Hitchcock, C.L.; Cronquist, A.; Ownbey, M.; Thompson, J.W.** Vascular plants of the Pacific Northwest. Part 1: Vascular cryptogams, gymnosperms, and monocotyledons. Seattle: University of Washington Press; **1969**. 914 p.
- Rummell, R.S.** Some effects of livestock grazing on ponderosa pine forest and range in central Washington. Ecology. 32: 594-607; **1951**.
- Tiedemann, A.R.; Klock, G.O.** Meeks Table Research Natural Area—reference sampling and habitat classification. Res. Pap. PNW-223. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; **1977**. 19 p.
- Williams, Clinton K.; Lillybridge, Terry R.** Forested plant associations of the Okanogan National Forest. R6-Ecol. 132b-1983. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region; **1983**. 140 p.

Appendix

Vascular Plants by Family and Plant Community

Aceraceae

Acer glabrum Torr. var. *douglasii* (Hook.) Dippel, Douglas' maple—rare to occasional on deeper soils within open to semiopen forest.

Apiaceae (Umbelliferae)

Lomatium canbyi Coult. & Rose, Canby's desert-parsley—rare along southern exposure of *Artemisia-Eriogonum/Poa* community.

Lomatium dissectum (Nutt.) Math. & Const. var. *dissectum*, fern-leaved lomatium—rare to occasional in *Artemisia* communities; also occasional along talus slopes extending off Meeks Table.

Lomatium gormanii (Howell) Coult. & Rose, Gorman's desert-parsley—rare in all *Artemisia* communities.

Lomatium grayi Coult. & Rose, Gray's lomatium—occasional in all *Artemisia* communities.

Lomatium macrocarpum (Nutt.) Coult. & Rose, large-fruit lomatium—common in *Artemisia-Eriogonum/Poa* community; rare to infrequent in *Artemisia/Sedum* and *Artemisia/Stipa* communities.

Lomatium nudicaule (Pursh) Coult. & Rose, barestem lomatium—occasional in all *Artemisia* communities; rare in *Pinus/Calamagrostis* community.

Lomatium triternatum (Pursh) Coult. & Rose var. *triternatum*, nine-leaf lomatium—occasional in all *Artemisia* communities and in forest communities.

Lomatium watsonii Coult. & Rose, Watson's desert-parsley—rare in *Artemisia-Eriogonum/Poa* community.

Osmorhiza chilensis H. & A., mountain sweet-cicely—rare to occasional in *Pseudotsuga/Calamagrostis* community.

Perideridia gairdneri (H. & A.) Math., Gairdner's yampah—rare to infrequent in *Pinus/Calamagrostis* and *Pseudotsuga/Calamagrostis* communities.

Asteraceae (Compositae)

Achillea millefolium L. ssp. *lanulosa* (Nutt.) Piper, western yarrow—common in *Pseudotsuga/Calamagrostis* community; rare to infrequent in *Pinus/Calamagrostis* and all *Artemisia* communities.

Agoseris aurantiaca (Hook.) Greene, orange agoseris—rare in transition areas between forest and *Artemisia* communities where soils are deep and tree canopies are open.

Agoseris glauca (Pursh) Raf., pale agoseris—rare to occasional in all *Artemisia* communities.

Agoseris heterophylla (Nutt.) Greene var. *heterophylla*, annual agoseris—occasional in *Artemisia/Stipa* community.

Anaphalis margaritacea (L.) B. & H., pearly everlasting—occasional in *Artemisia/Stipa* and *Pinus/Calamagrostis* communities, and along transition areas between forest communities and *Artemisia* communities.

Antennaria dimorpha (Nutt.) T. & G., low pussy-toes—occasional to common in all *Artemisia* communities.

Antennaria flagellaris Gray, stolonous everlasting—occasional in *Artemisia-Eriogonum/Poa* community; present in other *Artemisia* communities, but relative abundance not determined.

Antennaria luzuloides T. & G., woodrush pussy-toes—common in *Artemisia/Sedum* and *Artemisia/Stipa* communities.

Antennaria microphylla Rydb., rosy pussy-toes—infrequent in all *Artemisia* communities; rare in *Pinus/Calamagrostis* and *Pseudotsuga/Calamagrostis* communities.

Antennaria racemosa Hook., raceme pussy-toes—common in *Artemisia/Sedum* community; infrequent in *Artemisia/Stipa* community.

Arnica cordifolia Hook. var. *cordifolia*, heart-leaf arnica—abundant in *Pseudotsuga/Calamagrostis* community; common in *Pinus/Calamagrostis* community.

Arnica fulgens Pursh, orange arnica—rare in *Pseudotsuga/Calamagrostis* and *Artemisia/Stipa* communities.

Artemisia arbuscula Nutt. var. *arbuscula*, low sagebrush—abundant in all *Artemisia* communities.

Balsamorhiza careyana Gray var. *intermedia* Cronq., Carey's balsamroot—occasional to common in *Artemisia/Sedum* and *Artemisia/Stipa* communities; rare in *Artemisia-Eriogonum/Poa* community.

Balsamorhiza sagittata (Pursh) Nutt., arrowleaf balsamroot—rare along transition between *Artemisia* communities and forest communities.

Crepis intermedia Gray, gray hawksbeard—rare to infrequent in *Artemisia/Stipa* community.

Erigeron bloomeri Gray var. *bloomeri*, scabland fleabane—occasional in *Artemisia-Eriogonum/Poa* and *Artemisia/Sedum* communities.

Erigeron linearis (Hook.) Piper, desert yellow daisy—common in *Artemisia/Sedum* community; occasional in *Artemisia-Eriogonum/Poa* community; rare in *Artemisia/Stipa* community.

Haplopappus carthamoides (Hook.) Gray var. *cusickii* Gray, Columbia goldenweed—occasional in *Artemisia/Sedum* community; rare in *Artemisia/Stipa* community.

Haplopappus lanuginosus Gray var. *lanuginosus*, woolly goldenweed—common in *Artemisia/Stipa* community; rare in *Artemisia/Sedum* community.

Haplopappus resinosus (Nutt.) Gray, gnarled goldenweed—rare along access trail on ridge near west end of Meeks Table.

Haplopappus stenophyllus Gray, narrow-leaf goldenweed—common in *Artemisia-Eriogonum/Poa* community; rare in *Artemisia/Sedum* community.

Hieracium albiflorum Hook., white-flowered hawkweed—common in *Pinus/Calamagrostis* community; rare in *Pseudotsuga/Calamagrostis* community.

Hieracium cynoglossoides Arv.-Touv., houndstongue hawkweed—occasional in forest communities; rare in *Artemisia/Stipa* community and in transition to *Pinus/Calamagrostis* community.

Luina nardosmia (Gray) Cronq. var. *glabrata* (Piper) Cronq., silvercrown luina—common in *Pseudotsuga/Calamagrostis* community.

Madia glomerata Hook., cluster tarweed—occasional in *Artemisia/Stipa* community.

Microseris nutans (Geyer) Schultz-Bip., nodding microseris—rare in transition areas between *Artemisia* communities and forest communities.

Microseris troximoides Gray, false agoseris—common in *Artemisia/Stipa* community; occasional in *Artemisia/Sedum* community; rare in *Artemisia-Eriogonum/Poa* community.

Senecio integerrimus Nutt. var. *exaltatus* (Gray) Cronq., western groundsel—occasional in *Artemisia/Sedum* community; rare in *Pseudotsuga/Calamagrostis* community.

Berberidaceae

Berberis repens Lindl., low Oregon grape—rare in open areas with moderate soil development.

Boraginaceae

Cryptantha torreyana (Gray) Greene, Torrey's cryptantha—occasional in *Artemisia/Stipa* community; rare to infrequent in *Artemisia-Eriogonum/Poa* and *Artemisia/Sedum* communities; rare in *Pinus/Calamagrostis* community.

Brassicaceae (Cruciferae)

Arabis divaricarpa Nels., spreadingpod rockcress—rare in all *Artemisia* communities.

Arabis cf. *sparsiflora* Nutt. var. *subvillosa* (Wats.) Rollins, elegant rockcress—rare in all *Artemisia* communities.

Caprifoliaceae

Symphoricarpos oreophilus Gray var. *utahensis* (Rydb.) A. Nels., mountain snowberry—rare in forest communities.

Caryophyllaceae

Arenaria congesta Nutt. var. *congesta*, ballhead sandwort—rare in all *Artemisia* communities.

Arenaria congesta Nutt. var. *prolifera* Maguire, ballhead sandwort—occasional in *Artemisia-Eriogonum/Poa* community; common in *Artemisia/Sedum* and *Artemisia/Stipa* communities.

Arenaria macrophylla Hook., bigleaf sandwort—occasional in *Pinus/Calamagrostis* and *Pseudotsuga/Calamagrostis* communities; rare in all *Artemisia* communities.

Holosteum umbellatum L., jagged chickweed—occasional on south-facing slope immediately below ridge crest of Meeks Table.

Silene douglasii Hook. var. *douglasii*, Douglas' silene—rare in openings within forest communities.

Silene oregana Wats., Oregon silene—rare in *Artemisia/Stipa* and *Pinus/Calamagrostis* communities.

Celastraceae

Pachistima myrsinites (Pursh) Raf., mountain boxwood—rare in forest communities.

Crassulaceae

Sedum lanceolatum Torr. var. *lanceolatum*, lanceleaved stonecrop—rare in *Artemisia-Eriogonum/Poa* community.

Sedum leibergii Britt., Leiberg's stonecrop—occasional to common in all *Artemisia* communities.

Sedum stenopetalum Pursh, wormleaf stonecrop—abundant in *Artemisia/Sedum* community; common in *Artemisia/Stipa* community; occasional in *Artemisia-Eriogonum/Poa* community; rare in *Pinus/Calamagrostis* community.

Cupressaceae

Juniperus communis L. var. *montana* Ait., mountain juniper—rare in open areas with moderate soil development along east end of Meeks Table.

Cyperaceae

Carex geyeri Boott, elk sedge—abundant in forest communities; occasional in all *Artemisia* communities.

Carex rossii Boott, Ross sedge—reported by Rummell (1951) as occurring in *Pseudotsuga/Calamagrostis* community; not observed in 1983 or 1984.

Ericaceae

Arctostaphylos nevadensis Gray, pinemat manzanita—infrequent along transition between forest communities and *Artemisia-Eriogonum/Poa* and *Artemisia/Stipa* communities; rare in *Artemisia-Eriogonum/Poa* community.

Arctostaphylos uva-ursi (L.) Spreng., kinnikinnik—occasional in *Artemisia-Eriogonum/Poa* and *Artemisia/Stipa* communities.

Chimaphila umbellata (L.) Bart. var. *occidentalis* (Rydb.) Blake, prince's-pine—occasional in *Pseudotsuga/Calamagrostis* community.

Pterospora andromedea Nutt., woodland pinedrops—occasional in *Pinus/Calamagrostis* community; rare in *Pseudotsuga/Calamagrostis* community.

Vaccinium myrtillus L., low bilberry—rare in *Pseudotsuga/Calamagrostis* community.

Fabaceae (Leguminosae)

Lupinus laxiflorus Dougl. var. *laxiflorus*, spurred lupine—abundant in *Pinus/Calamagrostis* community; common in *Artemisia/Sedum* community; occasional in *Pseudotsuga/Calamagrostis* and *Artemisia/Stipa* communities; rare in *Artemisia-Eriogonum/Poa* community.

Lupinus polyphyllus Lindl. var. *burkei* (Wats.) Hitchc., bigleaf lupine—rare in *Pseudotsuga/Calamagrostis* community.

Gentianaceae

Frasera speciosa Dougl., giant fraseria—occasional in forest communities.

Grossulariaceae

Ribes cereum Dougl. var. *cereum*, squaw currant—occasional in *Artemisia-Eriogonum/Poa* community.

Ribes viscosissimum Pursh var. *viscosissimum*, sticky currant—rare in transition area between *Pinus/Calamagrostis* and *Artemisia* communities.

Hydrangeaceae

Philadelphus lewisii Pursh, mock orange—occasional along upper slopes of Meeks Table.

Hydrophyllaceae

Hesperochiron pumilus (Griseb.) Porter, dwarf hesperochiron—reported to occur in *Pinus/Calamagrostis* community.

Hydrophyllum capitatum Dougl. var. *capitatum*, ballhead waterleaf—rare in *Artemisia-Eriogonum/Poa* community.

Phacelia linearis (Pursh) Holz., threadleaf phacelia—occasional in *Artemisia-Eriogonum/Poa* community.

Phacelia sericea (Grah.) Gray, silky phacelia—occasional in *Artemisia/Stipa* community.

Iridaceae

Sisyrinchium douglasii A. Dietr., grass-widows—occasional in *Artemisia/Sedum* and *Artemisia/Stipa* communities; infrequent in *Artemisia-Eriogonum/Poa* and *Pinus/Calamagrostis* communities.

Liliaceae

Allium acuminatum Hook., tapertip onion—occasional in all *Artemisia* communities.

Calochortus macrocarpus Dougl., sagebrush mariposa—rare in transition areas between forest communities and *Artemisia* communities.

Erythronium grandiflorum Pursh var. *grandiflorum*, pale fawn-lily—occasional in *Artemisia/Sedum*, *Pinus/Calamagrostis*, and *Pseudotsuga/Calamagrostis* communities.

Fritillaria pudica (Pursh) Spreng., yellow bell—occasional in *Pinus/Calamagrostis* community; rare in *Artemisia/Stipa* community.

Lilium columbianum Hanson, tiger lily—common in *Pseudotsuga/Calamagrostis* community; occasional in *Pinus/Calamagrostis* community.

Zigadenus paniculatus (Nutt.) Wats., panicked death-camas—common in all *Artemisia* communities.

Zigadenus venenosus Wats. var. *gramineus* (Rydb.) Walsh, meadow death-camas—rare in all *Artemisia* communities and in *Pinus/Calamagrostis* community.

Loranthaceae

Arceuthobium douglasii Engelm., Douglas dwarf mistletoe—rare in *Pseudotsuga/Calamagrostis* community.

Onagraceae

Epilobium cf minutum Lindl., small-flowered willowweed—rare in *Artemisia-Eriogonum/Poa* and *Artemisia/Stipa* communities.

Epilobium angustifolium L., fireweed—occasional in *Pseudotsuga/Calamagrostis* community; rare in *Pinus/Calamagrostis* community.

Orchidaceae

Calypso bulbosa (L.) Oakes, fairy slipper—rare in forest communities.

Corallorhiza maculata Raf., Pacific coralroot—rare in *Pinus/Calamagrostis* community.

Goodyera oblongifolia Raf., western rattlesnake-plantain—rare in *Pinus/Calamagrostis* community.

Habenaria unalascensis (Spreng.) Wats., Alaska rein-orchid—occasional in *Pseudotsuga/Calamagrostis* community.

Orobanchaceae

Orobanche corymbosa (Rydb.) Ferris, flat-topped broomrape—rare in *Artemisia-Eriogonum/Poa* community.

Pinaceae

Abies grandis (Dougl.) Forbes, grand fir—common in *Pseudotsuga/Calamagrostis* community.

Larix occidentalis Nutt., western larch—common in *Pseudotsuga/Calamagrostis* community; rare in *Pinus/Calamagrostis* and *Artemisia/Sedum* communities.

Picea engelmannii Parry, Engelmann spruce—rare in *Pseudotsuga/Calamagrostis* community.

Pinus contorta Dougl. var. *latifolia* Engelm., lodgepole pine—rare in *Pseudotsuga/Calamagrostis* community.

Pinus ponderosa Dougl., ponderosa pine—abundant in *Pinus/Calamagrostis* community; common in *Pseudotsuga/Calamagrostis* community.

Pseudotsuga menziesii (Franco) Mirbel var. *menziesii*, Douglas-fir—abundant in *Pseudotsuga/Calamagrostis* community; common in *Pinus/Calamagrostis* community except along transition into *Artemisia/Stipa* community.

Poaceae (Gramineae)

Agropyron spicatum (Pursh) Scribn. & Smith, bluebunch wheatgrass—rare along south-facing slope immediately below Meeks Table and in *Artemisia-Eriogonum/Poa* community.

Agrostis exarata Trin. var. *monolepsis* (Torr.) Hitchc., spike bentgrass—rare beneath *Purshia tridentata* within *Artemisia-Eriogonum/Poa* community.

Bromus carinatus H. & A. var. *carinatus*, California brome—occasional in forest communities; rare in *Artemisia/Stipa* community.

Bromus tectorum L., cheatgrass—occasional in *Artemisia-Eriogonum/Poa* community.

Calamagrostis rubescens Buckl., pinegrass—abundant in forest communities; rare in *Artemisia/Stipa* community.

Danthonia intermedia Vasey, timber danthonia—occasional in *Artemisia/Sedum* community; rare in forest communities.

Danthonia unispicata (Thurb.) Munro, onespoke oatgrass—occasional in *Artemisia/Sedum* community; rare in *Artemisia/Stipa* and *Artemisia-Eriogonum/Poa* communities.

Festuca idahoensis Elmer var. *idahoensis*, Idaho fescue—rare in all *Artemisia* communities.

Festuca occidentalis Hook., western fescue—rare in openings in *Pinus/Calamagrostis* community.

Festuca octoflora Walt. var. *octoflora*, slender fescue—rare in *Artemisia-Eriogonum/Poa* and *Artemisia/Sedum* communities.

Festuca ovina L. var. *rydbergii* St.-Yves, sheep fescue—occasional in *Pseudotsuga/Calamagrostis* community; rare in *Pinus/Calamagrostis* community.

Koeleria cristata Pers., junegrass—occasional in *Pseudotsuga/Calamagrostis* community; rare in *Pinus/Calamagrostis* and all *Artemisia* communities.

Melica bulbosa Geter, oniongrass—occasional beneath *Purshia tridentata* within *Artemisia-Eriogonum/Poa* community.

Poa nervosa (Hook.) Vasey var. *wheeleri* (Vasey) Hitchc., Wheeler's bluegrass—occasional in forest communities and in *Artemisia/Stipa* community.

Poa secunda Presl, Sandberg's bluegrass—abundant in *Artemisia-Eriogonum/Poa* community; common in *Artemisia/Sedum* and *Artemisia/Stipa* communities.

Setaria viridis (L.) Beauv., green bristlegrass—rare along south slopes and ridge access trail to Meeks Table.

Sitanion hystrix (Nutt.) Smith var. *hordeoides* (Suksd.) Hitchc., bottlebrush squirreltail—occasional in *Artemisia-Eriogonum/Poa* and *Artemisia/Stipa* communities; rare in *Artemisia/Sedum* community.

Stipa lemmonii (Vasey) Scribn. var. *lemmonii*, Lemon's needlegrass—rare in *Artemisia-Eriogonum/Poa* and *Artemisia/Stipa* communities.

Stipa occidentalis Thurb. var. *minor* (Vasey) Hitchc., Columbia needlegrass—abundant in *Artemisia/Stipa* community; occasional in *Artemisia/Sedum* and *Artemisia-Eriogonum/Poa* communities.

Polemoniaceae

Collomia grandiflora Dougl., large-flowered collomia—rare in transition areas between *Pinus/Calamagrostis* community and *Artemisia/Stipa* and *Artemisia-Eriogonum/Poa* communities.

Linanthus harknessii (Curran) Greene, Harkness' linanthus—occasional in *Artemisia/Stipa* community.

Microsteris gracilis (Hook.) Greene var. *humilior* (Hook.) Cronq., pink microsteris—occasional in *Artemisia-Eriogonum/Poa* community.

Phlox diffusa Benth. var. *longistylis* (Wherry) Peck, spreading phlox—common in *Artemisia/Stipa* community; occasional in *Artemisia/Sedum* and *Artemisia-Eriogonum/Poa* communities.

Polygonaceae

Eriogonum compositum Dougl. var. *compositum*, northern buckwheat—occasional in *Artemisia-Eriogonum/Poa* community; rare in *Artemisia/Sedum* and *Artemisia/Stipa* communities.

Eriogonum douglasii Benth. var. *douglasii*, Douglas' buckwheat—abundant in *Artemisia-Eriogonum/Poa* community; occasional in *Artemisia/Sedum* and *Artemisia/Stipa* communities.

Eriogonum elatum Dougl., tall buckwheat—rare in *Artemisia/Stipa* community.

Eriogonum umbellatum Torr. var. *umbellatum*, sulfur buckwheat—rare in shallow soil along east end of Meeks Table.

Polygonum aviculare L., doorweed—rare along ridge access trail and within old fire pit.

Polygonum kelloggii Greene, Kellogg's knotweed—occasional in *Artemisia/Sedum* and *Artemisia/Stipa* communities; rare in *Artemisia-Eriogonum/Poa* community.

Polypodiaceae

Cystopteris fragilis (L.) Bernh., brittle bladder-fern—occasional in *Artemisia/Sedum* community and in rock crevices and ledges immediately below ridge crest of Meeks Table.

Portulacaceae

Claytonia lanceolata Pursh var. *lanceolata*, western springbeauty—occasional in *Artemisia/Sedum* community.

Lewisia rediviva Pursh, bitterroot—occasional to common in *Artemisia-Eriogonum/Poa* community.

Primulaceae

Dodecatheon cf. *conjugens* Greene, slimpod shooting star—rare in transition area between *Pseudotsuga/Calamagrostis* and *Artemisia/Sedum* communities.

Ranunculaceae

Delphinium nuttallianum Pritz. var. *nuttallianum*, upland larkspur—occasional in *Artemisia-Eriogonum/Poa* community.

Ranunculus glaberrimus Hook. var. *ellipticus* Greene, sagebrush buttercup—occasional along transition areas between forest communities and *Artemisia* communities.

Ranunculus glaberrimus Hook. var. *glaberrimus*, sagebrush buttercup—occasional along transition areas between forest communities and *Artemisia* communities.

Rhamnaceae

Ceanothus velutinus Dougl. var. *velutinus*, sticky laurel—rare in openings within *Pinus/Calamagrostis* community.

Rosaceae

Amelanchier alnifolia Nutt. var. *cusickii* (Fern.) Hitchc., western serviceberry—rare in *Pseudotsuga/Calamagrostis* community.

Geum triflorum Pursh var. *ciliatum* (Pursh) Fassett, old man's whiskers—common in *Artemisia/Sedum* and *Artemisia/Stipa* communities; occasional in *Pinus/Calamagrostis* community.

Holodiscus discolor (Pursh) Maxim., creambush oceanspray—common in *Pseudotsuga/Calamagrostis* community; rare in *Pinus/Calamagrostis* community.

Potentilla arguta Pursh var. *convallaria* (Rydb.) Wolf, tall cinquefoil—occasional in *Artemisia-Eriogonum/Poa* community; rare in *Pinus/Calamagrostis* community.

Potentilla fruticosa L., shrubby cinquefoil—occasional in *Artemisia/Stipa* community and in nonforested areas along east end of Meeks Table.

Potentilla gracilis Dougl. var. *flabelliformis* (Lehm.) Nutt., cinquefoil—rare in *Artemisia/Sedum* community and on north-facing slope immediately below summit of Meeks Table.

Prunus virginiana L. var. *melanocarpa* (Nels.) Sarg., chokecherry—rare in openings within forest communities.

Purshia tridentata (Pursh) DC., bitterbrush—common along east end of Meeks Table; occasional to common in *Artemisia-Eriogonum/Poa* community; rare in *Artemisia/Stipa* community.

Rosa gymnocarpa Nutt., baldhip rose—rare in openings within *Pseudotsuga/Calamagrostis* community.

Spiraea betulifolia Pall. var. *lucida* (Dougl.) Hitchc., shiny-leaf spiraea—occasional in *Pseudotsuga/Calamagrostis* community.

Rubiaceae

Galium multiflorum Kell., shrubby bedstraw—occasional in *Artemisia-Eriogonum/Poa* community and along south-facing slope immediately below ridge crest of Meeks Table.

Salicaceae

Salix scouleriana Barrett, Scouler willow—rare in *Pseudotsuga/Calamagrostis* community.

Saxifragaceae

Heuchera cylindrica Dougl., roundleaf alumroot—occasional in *Artemisia/Sedum* and *Artemisia/Stipa* communities and along north-facing slopes immediately below ridge crest of Meeks Table.

Lithophragma bulbifera Rydb., rocketstar—rare in all *Artemisia* communities.

Mitella pentandra Hook., alpine mitrewort—occasional in *Pseudotsuga/Calamagrostis* communities.

Scrophulariaceae

Castilleja miniata Dougl. var. *miniata*, common paintbrush—occasional in *Artemisia/Stipa* community.

Castilleja thompsonii Pennell, Thompson's paintbrush—occasional in all *Artemisia* communities.

Collinsia parviflora Lindl., small-flowered blue-eyed Mary—occasional in *Artemisia/Sedum* and *Artemisia/Stipa* communities; rare in *Artemisia-Eriogonum/Poa* and forest communities.

Cordylanthus capitatus Nutt., Yakima birdbeak—occasional in *Artemisia/Stipa* community; rare in *Artemisia-Eriogonum/Poa* community; population abundance fluctuates greatly from year to year.

Pedicularis racemosa Dougl. var. *alba* (Pennell) Cronq., sickletop lousewort—rare in *Artemisia/Sedum* community.

Pedicularis racemosa Dougl. var. *racemosa*, sickletop lousewort—rare in openings within forest communities.

Penstemon attenuatus Dougl. var. *attenuatus*, sulfur penstemon—occasional in *Pseudotsuga/Calamagrostis* communities.

Penstemon fruiticosus (Pursh) Greene var. *fruiticosus*, shrubby penstemon—rare in *Pseudotsuga/Calamagrostis* community.

Penstemon gairdneri Hook. var. *gairdneri*, Gairdner's penstemon—occasional to common in *Artemisia-Eriogonum/Poa* community; rare in *Artemisia/Stipa* community.

Penstemon richardsonii Dougl. var. *richardsonii*, Richard's penstemon—rare in un-forested areas along east end of Meeks Table.

Violaceae

Viola nuttallii Pursh var. cf. *bakeri* (Greene) Hitchc., Baker violet—rare along transition areas between *Pinus/Calamagrostis* community and *Artemisia* communities.

Viola trinervata Howell, sagebrush violet—rare to occasional in all *Artemisia* communities.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.

The U.S. Department of Agriculture is an Equal Opportunity Employer. Applicants for all Department programs will be given equal consideration without regard to age, race, color, sex, religion, or national origin.

Pacific Northwest Research Station
319 S.W. Pine St.
P.O. Box 3890
Portland, Oregon 97208

U.S. Department of Agriculture
Pacific Northwest Research Station
319 S.W. Pine Street
P.O. Box 3890
Portland, Oregon 97208

BULK R
POSTAC
FEES F
USDA-
PERMIT N

Official Business
Penalty for Private Use, \$300

do NOT detach label